New year begins with a sudden stratospheric warming

Description

Meteorologists are already able to note a significant atmospheric observation in their 2021 diaries with the beginning of a Sudden Stratospheric Warming (SSW), which started over the weekend – this was forecast last week.

A SSW sees cold air descending above the Arctic, resulting in warming by as much as 50°C. This is in association with a significant weakening or reversal of westerly winds circulating around the North Pole between 10 and 50 km above the ground – the stratospheric polar vortex.

Professor Adam Scaife – head of long-range prediction at the Met Office – said: “As predicted, atmospheric observations are now showing that the Arctic stratosphere is undergoing a sudden warming event associated with a weakening stratospheric polar vortex.”

During these events the vortex can break down completely, and when this happens the disruption in the stratosphere can trigger a shift from westerly to easterly winds which can be followed by lower-altitude winds shifting in the same direction. On average 70 percent of occasions see this switch to easterly conditions at ground level, with the resulting cold and easterly shift in our weather.

Matthew Lehnert is an Expert Operational Meteorologist with the Met Office. He said: “Although the prolonged cold spell and snow events in February and March of 2018 – dubbed the ‘Beast from the East’ by the UK media – were linked to a sudden stratospheric warming, the record warm spell that occurred in February 2019 also followed such an event.”

Paul Davies is the Met Office’s Chief Meteorologist. He added: “We can’t completely rule out a signal for colder weather following this SSW event later in the month. However, evidence from model data and other drivers of the UK weather support a return to relatively milder and more unsettled conditions next week.”

Date Created
January 2021

Fingerprints of climate change on UK weather in 2020

Description

2020 was a remarkable year for our climate, with the year being the UK's third warmest, sixth wettest and eighth sunniest in the UK national series, extending back to 1884, 1862 and 1919, respectively. An attribution study looking at the temperatures for 2020 has been produced by the Met Office using peer-reviewed methods. The result is available on Carbon Brief. It suggests that without human-induced climate change, a year as warm as 2020 in the UK would have a likelihood of 1.1 % (uncertainty range 0.9 % – 1.3 %), or around one year in 90. For the present day climate the likelihood estimate increases by around a factor of 50, to 56% (range 53 % – 58 %) suggesting an expectation that we would now expect around half of years to exceed the warmth of 2020.
The impact of climate change on total annual rainfall for the UK is less clear than for temperature. This is a consequence of the high variability in rainfall over the UK, and also because climate change is most likely to result in wetter winters and drier summers overall, change which will consequently be less obvious in an annual total. However the likelihood of years as wet as 2020 is increasing, and is expected to continue to do so through the 21st Century.
Dr Mark McCarthy is the head of the Met Office's National Climate Information Centre. He said: "The dominance of above average temperatures throughout the year are clearly apparent, with notable warm spells in April, June, August, and November. Only July and October being cooler than average overall. The exceptional rainfall in late winter followed by the extended dry and sunny spring really dominate the rainfall and sunshine series for the year."
Dr Nikos Christidis is a senior climate scientist with the Met Office. Nikos, who specialises in climate attribution, said: "An attribution study allows you to run scenarios on climate models using varying concentrations of atmospheric greenhouse gases. By looking at the atmosphere of pre-industrial times you can see that the high annual mean temperature of 2020 would have been quite a rare event. But with today's levels of greenhouse gases we can expect temperatures of this level to occur slightly more frequently than one year in two. In future this will increase further."
Dr Mark McCarthy added: "Our weather is playing out on a background of ongoing global climate change. It is therefore no surprise at all that the UK climate is also continuing to change as a result. The UK has warmed by close to 1.0 °C, comparable to the global rise in mean temperature."

Date Created
January 2021

Why the beast from the east is unlikely to roar.

Description

A sudden stratospheric warming high in the atmosphere early in January has led to reports a so called ‘Beast from the East’ is heading our way and speculation of extreme cold weather to come.

A sudden stratospheric warming (SSW) sees a rise in temperature and change in wind direction in the atmosphere high above the Arctic. This happens at an altitude of about 30 km so has a delayed influence on weather at the earth’s surface. We usually start to see knock-on effects on the jet stream a couple of weeks later, which can in turn affect the day to day weather across Europe and the UK.

Met Office Chief Meteorologist, Paul Davies, said; “The unsettled, wintry weather forecast for next week is consistent with the expected effects of an SSW and there is a chance there could be more snow in parts of the UK and Europe.

“However, the winds will be generally from a northerly direction not from the east, as cold air from Scandinavia is drawn across the UK. So perhaps not a Beast from the East but normal wintry weather from the north.”

The cold northerly air is likely to be once again held to the east side of the UK as milder air pushes in from the west. Where these two air masses meet weather fronts will bring rain, which could be heavy at times and turn to snow, especially over higher ground. This suggests the potential for big differences in the weather across the UK next week, with temperatures most likely to be rather cold for the north and near-or slightly above-average across the south. There is always uncertainty when conflicting air masses meet, however, so some cold spells can’t be ruled out here also.

> There's heavy snow in places today, but what about the weekend and beyond? ??
>
> Here's the 10 day trend from yesterday ? https://t.co/8ByHgkQZ2a
>
> — Met Office (@metoffice) January 14, 2021

Keep up to date with the latest weather warnings and the forecast for your area using the warning and forecast pages on our website. You can also follow us on Twitter and Facebook, as well as using our mobile app which is available for iPhone from the App store and for Android from the Google Play store.

Date Created
January 2021

A day in the life of a Mobile Met Unit Meteorologist

Description

Dave is a Senior Operational Meteorologist with the Mobile Met Unit (MMU) deployed on Operation TORAL, the British element of NATO's Resolute Support mission in Afghanistan.

The MMU is a Sponsored Reserve unit of the Royal Air Force (RAF) comprised of Met Office meteorologists and engineers. Dave tells us about life on deployment and what the MMU means to him.

My role on Operation Toral is to provide meteorological support to the rotary aviation detachment in Kabul. As such, my day is dictated chiefly by the flying programme, working as part of operations to maximize efficiency whilst preserving flight safety.

Daily Routine

On a standard day, I will be in the office 3 hours before take-off, which can provide some rather early starts, before briefing the aircrew on the day ahead. Once the aircrew are airborne, my focus shifts to the next day to advise shaping of the programme where possible to avoid any likely delays owing to weather.

By the nature of operations, events are subject to change, so I remain in the office to advise of upcoming weather impacts through the medium term or update the brief if short notice changes of task occur. During flying, I keep an eye on the current weather to ensure any developments or change of forecast are made known to the operations room, engineers and aircrew.

As Operation Toral is a well-founded detachment, conditions are not too dissimilar from working in an office in the UK, except for the sidearm on my hip and tourniquet in my pocket! However, everyone from the Senior Aircraftman on their first tour to the squadron boss never forgets our task or the ever-present threat in country, as it is our role to minimize road moves around theatre to keep our people safe and to support the ongoing NATO training mission.

Creating the forecast

Formulating the forecast is similar to the process you'd go through anywhere. It starts with assessing a mixture of observations, including a weather balloon ascent and satellite imagery, together with weather models from the Met Office and other national centres, alongside broad guidance from Met Office Headquarters in Exeter. The difference being you're the only Met Office forecaster for a couple of thousand miles in a data sparse area, so the model isn't as refined and the best guidance will still be fairly broad so you have to use your own initiative and experience if a sudden decision comes your way.

Background activities include recording statistics and commenting on model performance and guidance to help improve the next iteration of the model, with the MMU presenting a unique viewpoint compared to the UK centric bulk of Met Office operations.

As the afternoon presses on, weather conditions that may deteriorate into the night are reassessed, notably smog, snow or surface ice in the winter, and if required I will be preparing to brief any night flying alongside some prep work for the coming day's forecast. Then there are some additional external forecasts for the airbridge between the UK and theatre to send to the UK alongside a radio piece for the British Forces Broadcasting Service (BFBS).

Fit to fight

Fitness is always a priority in the military so running laps or a quick trip to the COVID-Secure outdoor gym is encouraged, although as Kabul occasionally steals the title of most polluted air in the world during the winter, most prefer to go mid-afternoon as the smog is at its most dispersed!

The day concludes with a debrief for the aircrew – an opportunity to review the day, where I get the aircrew's experience of the weather as they encountered it, enabling a better understanding of local meteorological effects and a better forecast in future.

Finally, it's off to the D-Fac (that's dining facility to you) for dinner, then off to my bunk to catch the folks back home (4.5 hours behind Afghan) thanks to the good internet – another bonus of a well-founded base, which is never a guarantee! Then it's to bed and repeat until your replacement flies in.

What does the MMU mean to me?

For me, the Mobile Met Unit is the best of the Met Office in one place, the opportunity to work where your output immediately impacts the outcome, and that outcome matters. It is a role where a high degree of autonomy is required, but one where the whole Met Office from the guidance unit to the science department is on hand to help if you need it. Nonetheless, where time allows, I have been involved in charity runs, festive football matches, many a dry pub quiz and even some seriously amateur volleyball; it is a step apart from life in the UK but you are doing so as part of a team, working as part of the RAF, and it builds a great sense of camaraderie – I truly enjoy working with them.

Pictured is a Puma HC.Mk 2 helicopter normally based at RAF Benson in Oxford, currently serving in Kabul, Afghanistan on Op TORAL. The helicopter provides transport and support to coalition personnel based in and around Kabul. The aircraft is used in a variety of combat roles, including the tactical movement of troops, weapons, ammunition and stores on the

battlefield, as well as the extraction of casualties and in response to medical emergencies on the frontline. It is also employed during non-combatant evacuations, and humanitarian and disaster relief operations.

Date Created
January 2021

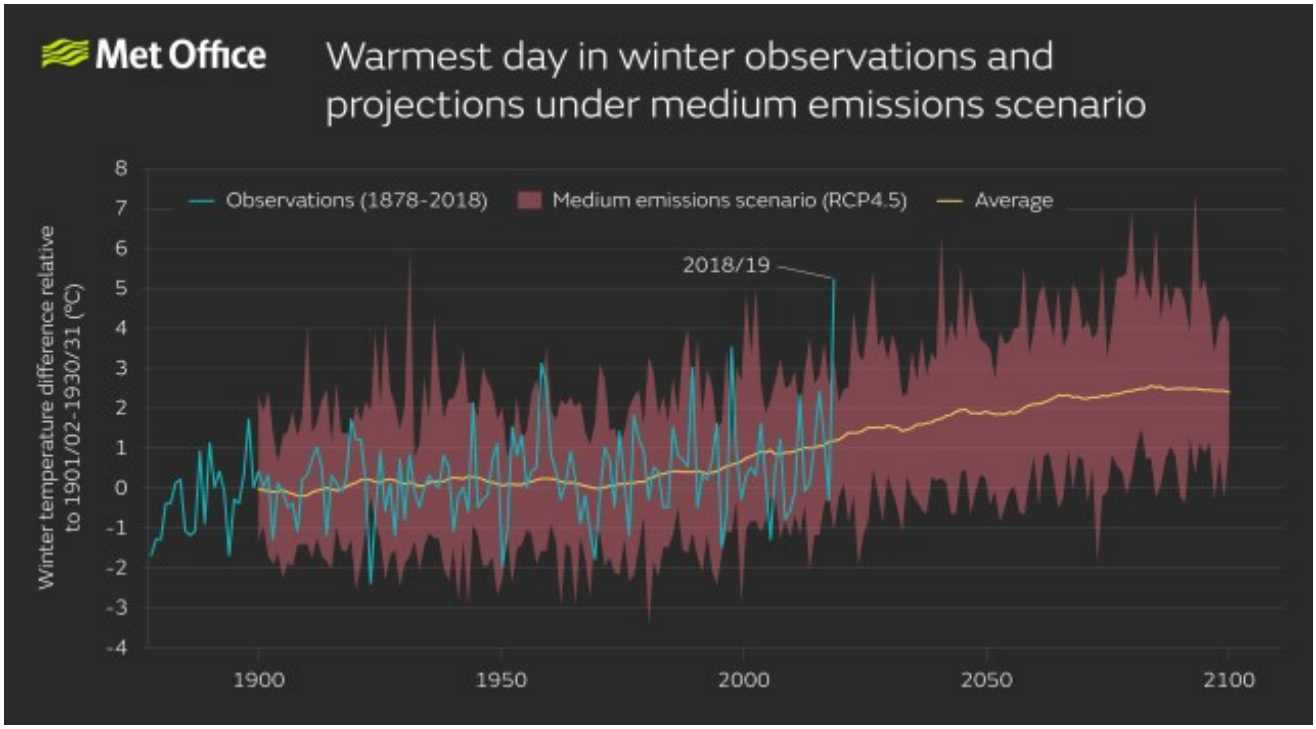
Are we going to see more hot winter days like we did in February 2019?

Description

A recent study by the Met Office reviewed the question of whether exceeding 40°C is now within the possibilities of the UK climate, after experiencing a record-breaking temperature of 38.7°C in July 2019. The results showed that under a high emissions scenario, where the world takes no action to reduce our greenhouse gas emissions, the UK could see 40°C days as frequently as every 3-4 years.

The research prompts further investigation into the UK's warming climate – particularly in light of record-breaking winter temperatures, whereby Kew Gardens experienced a record-breaking temperature of 21.2°C on 26th Feb 2019. In a new study, the Met Office Hadley Centre's Dr Nikolaos Christidis and Professor Peter Stott review these extraordinary warm temperatures. Their work has been published in a special report on 'Explaining Extremes of 2019 from a Climate Perspective' by The Bulletin of the American Meteorological Society (BAMS). This special report presents assessments of how human-caused climate change may have affected the strength and likelihood of individual extreme events.

The research by the Met Office Hadley Centre is two-fold, reviewing the role that atmospheric state has on such extreme events, and then investigating the role that anthropogenic warming has on the likelihood of warm winter days.



The graph shows the warmest day in winter in central England over time relative to 1901/02–1930/31 averaging period, this time period was used as attribution studies prefer to use baselines as close to the pre-industrial climate as possible, the available model data start in 1900. Observations are plotted in blue. The medium emissions scenario (RCP4.5)

projections range is in red. The yellow line shows the average of projections.

In February 2019 strong anticyclonic conditions brought warm tropical maritime air over western parts of the UK. These conditions alone can raise UK winter temperatures over 20°C, even without the effect of human influence on climate.

However, 2019's anomaly on 26th February is +5.2°C warmer than baseline conditions set over 1901-1930. This is 1.5 times higher than the previous warm record (+3.5°C), and six times higher than the 1900-2018 warming (+0.87°C), begging the question: Does anthropogenic warming under a medium emissions scenario (RCP4.5) influence the likelihood of the extreme event?

Extreme years like 2018/19 are currently very rare with return times (how often we would expect a threshold to be passed) of the order of a thousand years. However, when considering anthropogenic climate change, they become increasingly common, expected to occur once or twice a century by 2100. The chance of a winter day warmer than 20°C becomes 300 times more likely. This risk is expected to increase if we consider an emissions scenario greater than RCP4.5.

There is also an aspect of the intensity of extremes to consider: events as rare as 2018/19 presently correspond to a +5.2°C anomaly, increasing to +7°C by 2100, so winter heat extreme could not only be more frequent, but also more severe.

Dr Nikolaos Christidis summarises, "As well as summer heat extremes, we now see evidence of winter heat extremes in the UK being influenced by human induced climate change. Under a medium emissions scenario, the warm winter of 2018/2019 is up to 300 times more likely. However, if carbon emissions are limited, so too may the frequency and intensity of warm winter events."

This evidence is consistent with the headline findings from the UKCP18 climate projections, taking the overall effect of anthropogenic climate change into account, milder winters are expected in the UK, with less frequent cold extremes and new high temperature records. The findings from this research are important to help the UK plan for future extremes, informing effective adaptation and mitigation strategies to limit impacts of climate change on UK society now and in the future.

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